
2. Compliance and Enforcement

2.1 Overview

Primary responsibility for compliance and enforcement with Energy Commission energy efficiency standards rests with the local building department, which is typically associated with a city or county government. Low-rise residential buildings must obtain a permit from the local jurisdiction before a new building may be constructed, before constructing an addition, and before alterations may be made to existing buildings. Before a permit is issued, the local jurisdiction examines the plans and specifications to verify that all applicable codes and standards are being complied with. The energy efficiency standards are just one of the plan check responsibilities. The plans examiner must also deal with the building code, the plumbing code, the electrical code, and the mechanical code.

Once the local jurisdiction has determined that the proposed building (as represented on the plans) complies with all applicable codes and standards, a building permit is issued. This is the first significant milestone in the compliance and enforcement process. After building construction is complete, the local jurisdiction then issues the certificate of occupancy or completes the final inspection, another significant milestone.

While the permit and the certificate of occupancy are the most significant milestones, the compliance and enforcement process is significantly more involved and requires participation by a number of other players including the architect or building designer, specialty engineers (mechanical, electrical, civil, etc.), energy consultants, contractors, the owner, third party inspectors (HERS raters), and many others.

The purpose of this chapter is to describe the overall process and to identify the roles of each party.

2.2 Compliance and Enforcement Phases

The process of complying with and enforcing energy efficiency goals in residential buildings involves many parties. Those involved may include the architect or designer, builder/developer, purchasing agent, general contractor, subcontractor/installer, energy consultant, plan checker, inspector, realtor, and owner/first occupant. All of these parties must communicate for the compliance/enforcement process to run efficiently.

The standards specify detailed reporting requirements that are intended to provide design, construction, and enforcement parties with needed information to complete the building process and ensure that the energy features are installed. Each party is accountable for ensuring that the building's energy features are correctly installed in their area of responsibility.

This section outlines each phase of the process, discussing responsibilities and requirements during the phase.

2.2.1 Design Phase

§10-103(a)(2)

This phase sets the stage for the type and style of building to be constructed. In addition to issues concerning zoning, lot orientation and infrastructure, the building's overall design and energy features are documented in the construction documents and/or specifications. Parties associated with this phase must ensure that the building complies with the standards and that the significant features required for compliance are documented on the plans and/or specifications.

During the design process, an energy consultant or other professional will typically make calculations to ensure that the building complies with the standards. When appropriate, recommendations or alternatives will be suggested to achieve compliance.

Plans and specifications are required to contain details to show the building features that are necessary to achieve compliance, including insulation levels, window performance, equipment performance, sealing and weather stripping requirements, and any other feature that was used for compliance or is a mandatory measure. Essentially the plans and specifications will be complete and thorough with regard to energy efficiency features.

2.2.2 Permit Application

§10-103(a)2

When the design is complete, the construction documents are prepared, and when other approvals (planning department, water, etc.) are secured, the owner or contractor makes an application for a building permit. This is generally the last step in a long process of planning and design. At this point, the infrastructure (streets, sewers, water lines, electricity, gas, etc.) is in place or is being constructed and it is time to begin the process of constructing the building(s).

To assist the building department in verifying that the proposed building complies with the energy efficiency standards, a set of compliance documents are submitted with the building permit application. These documents consist of a Certificate of Compliance, which is required by the energy efficiency standards (see §10-103). The length and complexity of the documentation can vary considerably depending on the number of buildings that are being permitted, whether or not an orientation-independent permit is being requested, whether the performance approach or the prescriptive approach is being used, and many other factors. An energy consultant who understands the code and is able to help the builder or owner comply with the standards in the most cost effective manner often prepares the compliance documents.

The administrative standards §10-103(a)2 require that documentation be submitted with permit applications that will enable the plans examiner to verify the building's compliance. The forms used to demonstrate compliance must be

readily legible and of substantially similar format and informational order as those specified in this compliance manual.

2.2.3 Plan Check

Local building departments check plans for conformance to building standards. This includes health and safety requirements, such as fire and structural, along with energy requirements. Vague and/or missing details on the construction documents must be corrected or clarified. Complete plans help to speed the plan check process, as the plans examiner would have all the information that they need to complete the review. Having to go back to the applicant and request more information is always a time consuming process that can be minimized with more complete construction documents.

From the building department's perspective, their job is to verify that the information contained on the construction documents matches the information that is contained on the energy efficiency compliance documents. Contractors in the field will seldom look at the compliance document when they do their job. Instead, they will rely on the plans and specifications for direction. It is essential that the building represented on the plans and specifications complies with the energy efficiency standards. The compliance documents are a tool to ensure this.

The building department also verifies that the compliance documents do not contain errors. When the compliance documents are produced by Energy Commission-approved computer programs, there is less chance that there will be computational errors, but it is still essential that the plans examiner verify that the building represented on the plans is the same building that is represented in the compliance documents. To obtain a list of Energy Commission approved compliance programs visit their Website at:

http://www.energy.ca.gov/title24/2005standards/2005_computer_prog_list.html



Or call the Efficiency Standards Hotline at 916-654-5106.

With production homes, where a builder may be constructing several identical houses at roughly the same time, the compliance documentation may be prepared in such a way that a house or model can be constructed in any orientation. When an application is filed for orientation independence, it usually follows the performance approach – if the house is shown to comply when oriented along the four main compass points, it can be assumed to comply in any orientation.

2.2.4 Building Permit

When the plans examiner is satisfied that the building meets the standards, the building permit is issued. This is the first significant milestone in the compliance and enforcement process. The building permit is the green light for the contractor to begin the work. In some cases, the building permits are issued in phases. Sometimes there is a permit for site work and grading that precedes the permit for actual building construction.

2.2.5 Construction Phase

Upon receiving a building permit from the local building department, the contractor begins construction. The permit requires the contractor to construct the building in substantial compliance with the plans and specifications, but often there are variations. Some of these variations are formalized through change orders. When change orders are issued, it is the responsibility of the permit applicant and the local jurisdiction to verify that compliance with the code is not compromised by the change order. In some cases, it will be quite clear if a change order would compromise compliance, for instance when an inexpensive single glazed window is substituted for a more expensive high performance window. Other times, it will be difficult to determine if a change order would compromise compliance, for instance when the location of a window is changed or when the configuration of the house is changed. Field changes that may result in non-compliance require building department approval of revised plans and energy compliance documentation demonstrating that the building is still in compliance.

During the construction process, the general contractor or specialty contractors are required to complete various construction certificates. The purpose of these certificates is to verify that the contractor is aware of the requirements of the standards and that they have followed the Energy Commission-approved procedures for installation. The Installation Certificate (CF-6R) is really several separate certificates that are completed by each contractor as they install the windows the water heater and plumbing the HVAC ducts and equipment, the insulation, and by the contractor or specialist responsible for building envelope tightness.

2.2.6 Building Department Field Inspection

Local building departments, or their representatives, inspect all new buildings to ensure conformance to building standards. Field construction changes and non-complying energy features require parties associated with previous phases to repeat and revise their original energy compliance documents.

Building departments will make multiple visits to a building site to verify construction. The first visit is typically made just before it is time to pour the slab or the building foundation. At this visit, the building inspector verifies that the proper reinforcing steel is in place and that necessary wiring and plumbing that will be embedded in the slab meets the requirements of the standards. This would be the best time to verify features that may be installed in concrete slab floors such as slab edge insulation or hot water recirculation loops that where piping is installed in the slab, see Section 3.3.6, Slab Insulation in the Envelope Chapter of this manual.

The second visit comes after the walls have been framed in and the wiring, plumbing, and other services have been roughed in. This inspection is generally made before the insulation is installed, otherwise it would be more difficult to verify that the services are in compliance with building code requirements. This would also be the best time to assure sealing and caulking around windows and caulking and sealing or caulking of holes through the framing for piping or electrical penetrations are complete.

The third and final inspection comes at the end after the walls have been closed and the final electrical and plumbing fixtures are in place. In the typical building inspection process, it is difficult to verify that energy efficiency is being achieved at this point. For instance, the insulation is not in place at the time of the framing inspection and is concealed at the time of the final inspection. For this and other reasons, the Installation Certificate and or field verification and/or diagnostic testing is critical. The Installation Certificate certifies the R-value of insulation installed in the roof, ceiling, walls, floor, slab and foundation walls, including the brand, thermal resistance (R-value), and the thickness.

2.2.7 Field Verification and/or Diagnostic Testing

Some building features require field verification and/or diagnostic testing by a third party inspector. The Energy Commission has a process for certifying HERS raters, and a certified HERS rater is required when field verification and/or diagnostic testing is necessary.

Both prescriptive packages C and D as well as most performance method applications require some sort of field verification and/or diagnostic testing. Some of the typical measures that require field verification and/or diagnostic testing are split system air conditioners, thermostatic expansion valve (TXV) and duct sealing. Other measures requiring verification include air, refrigerant charge, reduced duct surface area, increased duct R-value, and high EER cooling equipment. Other measures that require diagnostic testing are reduced infiltration through blower door testing and reduced fan power. Quality installation of insulation is another measure that requires field verification and/or diagnostic testing.

The requirements for field verification and/or diagnostic testing apply only when equipment or systems are installed that require verification or testing. If a house has no air distribution ducts, then a HERS rater does not have to test the ducts, since there are no ducts to test. Similarly, if a house showing prescriptive compliance does not have a split system air conditioner or heat pump, then a HERS rater does not have to test the refrigerant charge or verify that there is a TXV, because the requirements do not apply. Likewise, if compliance for a house is achieved using an alternative that does not require a TXV, then a HERS rater does not have to come to the site and verify that one has been installed.

Some homes along the coast are built without air conditioning and use hydronic systems or other heating systems without air distribution ducts. In this case, a HERS rater is not required, even when prescriptive package D or C is used for compliance, unless compliance credit is desired for measures such as quality insulation installation (see Residential ACM Appendix RH).

2.2.8 Approval for Occupancy

In multifamily dwellings of three and more units, the final step in the compliance and enforcement process is when the building department issues an occupancy permit. This is the green light for occupants to move in. Single family dwellings and duplexes may be approved for occupancy without an occupancy permit

being issued. Often a signed-off final inspection serves as an approval for occupancy. Prior to the approval for occupancy a signed CF-4R must be provided to the building official by the HERS rater (HERS rater must provide copies of CF-4R to builder, HERS provider, and building official) if field verification or diagnostic testing is required by the compliance documentation.

2.2.9 Occupancy

At the occupancy phase, the builder is required to provide the homeowner with a manual that contains instructions for operating and maintaining the features of their building efficiently. See below for more details.

2.3 Energy Standards Compliance Documentation

Compliance documentation includes the forms, reports and other information that is submitted to the building department with an application for a building permit. It also includes documentation completed by the contractor or specialty contractors to verify that certain systems and equipment have been correctly installed. It may include reports and test results by third party inspectors (HERS raters). Ultimately, the compliance documentation (or information from the compliance documentation) is included with a homeowner's manual so that the end user knows what energy features are installed in the house.

Compliance documentation is completed at the building permit phase, the construction phase, the testing and verification phase and at the final phase. The required forms and documents are shown in Table 2-1 and described in the rest of this section in more detail.

Table 2-1 – Documentation Requirements, Prescriptive and Performance Compliance Methods

Phase	Method	Documentation Required when applicable
Building Permit	Prescriptive and Performance	CF-1R, Certificate of Compliance
	Prescriptive and Performance	MF-1R, Mandatory Measures Checklist
	Prescriptive	WS-1R, Thermal Mass Worksheet Checklist
	Prescriptive	WS-2R, Area Weighted Average Calculation Worksheet
	Prescriptive	WS-3R, Solar Heat Gain Coefficient (SHGC)
	Prescriptive	WS-4R, Fenestration – Maximum Allowed Worksheet
	Prescriptive and Performance	WS-5R, Residential Kitchen Lighting Worksheet
	Prescriptive and Performance	CF-SR, Solar Water Heating Calculation Form
Field Verification and/or Diagnostic Testing	Prescriptive and Performance	CF-4R, Certificate of Field Verification and Diagnostic Testing
Construction	Prescriptive and Performance	CF-6R, Installation Certificate

2.3.1 Building Permit Phase Documentation

§10-103(a)2

Compliance documents at the building permit phase include:

- Certificate of Compliance (CF-1R)
- Mandatory Features Checklist (MF-1R)

Depending on the compliance approach, the building permit compliance documentation may also include the Solar Water Heating Calculation Form (CF-SR), the Thermal Mass Worksheet (WS-1R), the Area Weighted Average Calculation Worksheet (WS-2R), the Solar Heat Gain Coefficient (SGHC) Worksheet (WS-3R), however; the Residential Kitchen Lighting Worksheet (WS-5R) is required for both compliance approaches. Blank copies of these documents are included in Appendix A for use with the prescriptive compliance requirements. When the performance approach is used, see Table 2-1 for applicable required forms needed for Energy Commission-approved software.

The purpose of the compliance documentation is to enable the plans examiner to verify that the building design complies with the standards and to enable the field inspector to readily identify building features that are required for compliance.

Certificate of Compliance (CF-1R)

The standards require that a certificate of compliance be included on the plans. The performance CF-1R form summarizes the minimum energy performance specifications needed for compliance including the results of the heating and cooling load calculations.

Placing a copy of the CF-1R on the drawings, taping a CF-1R to the drawings or printing the CF-1R information directly on the drawings may meet the requirement that the certificate be on the plans. Verify with the local enforcement agency which is acceptable.

Mandatory Measures Checklist (MF-1R)

The mandatory measures checklist serves two purposes: it allows the designer to acknowledge their responsibility to include the features in the design and it is used in the field to verify that each of the mandatory measures is in compliance. The information on the mandatory measures checklist may be placed on the plans along with the Certificate of Compliance. Alternatively, the designer must ensure that all applicable mandatory features are indicated on the plans and specifications.

2.3.2 Construction Phase Documentation (CF-6R)

§10-103(a)3 and 4

The installation certificate, CF-6R, is completed during the construction phase of the compliance and enforcement process. The CF-6R is really several documents in one. The documents are completed by the contractors responsible for installing the windows (fenestration), the air distribution ducts and the HVAC equipment, the measures that affect building envelope tightness, the lighting system, and the insulation.

The CF-6R is signed by various installers.

- HVAC Systems. The contractor who installs mechanical equipment signs this part. Heating and cooling equipment are listed and the energy efficiency, capacity, design loads and other properties of each piece of equipment is documented.
- Water Heating Systems. This part includes information about the water heating equipment installed in the building, including model number, energy efficiency, tank size, input rating and other properties. The installer also verifies that faucets and shower heads are certified and comply with the appliance standards.
- Fenestration/Glazing. This part includes a list of all windows installed in the home. For each, the U-factor, SHGC, area, number of panes, and number of windows of this type in the building are indicated. This section is signed by the contractor that installs the windows.
- Duct Leakage and Design Diagnostics. This part is signed by the contractor responsible for installing the HVAC air distribution ducts and verifying that they comply with the leakage requirements. On this form the contractor includes the results of diagnostic tests, which will later be verified by a third-party inspector (HERS rater).
- Refrigerant Charge and Airflow Measurement. This part is signed by the contractor responsible for verifying that split system air conditioner and heat pumps have the correct refrigerant charge. This form contains diagnostic data that are later verified by a third-party inspector (HERS rater).
- Duct Location and Area Reduction Diagnostics. This part is completed and signed by the contractor who installs the HVAC air distribution ducts. It verifies the location of the ducts and/or includes information on duct location. This form is used only when the default duct area is not assumed.
- Building Envelope Leakage Diagnostics. This part is completed by the contractor responsible for testing building envelope leakage through pressurization of the house. This form contains

test results that will later be verified by a third-party inspector (HERS rater).

- Insulation Certificate. This part is completed and signed by the contractor responsible for installing the insulation. This indicates the manufacturer, brand, and thermal properties of insulation installed in the roof, ceiling, walls, and floor.
- Insulation Quality Checklist. This part is completed and signed by the insulation contractor when credit is taken for quality insulation installation. This is later verified by a third-party inspector (HERS rater). Credit for quality insulation installation is new with the 2005 standards.
- Lighting Systems. This part is completed and signed by the contractor responsible for installing hard-wired lighting systems.

Persons signing these CF-6R forms are verifying that the installed efficiencies or requirements meet or exceed those used for compliance with the standards as shown on the CF-1R. The CF-6R must be posted at the job site in a conspicuous location (e.g., in the garage) or kept with the building permit and made available to the enforcement agency upon request.

When field verification and/or diagnostic testing is required for a home, the builder shall provide a copy of the CF-6R to the HERS provider and to the building department upon request.

Information from the CF-6R is included with the homeowners' manual (see below). This provides the homeowner with information about energy efficiency features installed in their home.

2.3.3 Field Verification and/or Diagnostic Testing Documentation (CF-4R)

Many of the prescriptive requirements and some of the measures that may be used for compliance in the performance approach may require field verification and/or diagnostic testing. This must be performed by a third-party inspector that is specially trained and independent from the builder or general contractor. The Energy Commission recognizes HERS raters for this purpose.

When field verification and/or diagnostic testing is required, the *Certificate of Field Verification and Diagnostic Testing* (CF-4R) is completed and signed by the HERS rater. These documents include information about the measurements and tests that were performed. The HERS rater verifies that the requirements for compliance credit have been met.

The HERS rater provides the certificate to the builder, the HERS provider, and the building department. The builder is ultimately responsible for ensuring that the building department has received the CF-4R prior to the occupancy permit or final inspection.

Raters shall provide a separate CF-4R form for each house the rater determines has met the diagnostic requirements for compliance. The HERS rater shall not sign a CF-4R form for a house that does not have a CF-6R signed by the installer.

Form CF-4R requires a signature from a HERS rater, certifying whether the building was tested or approved as part of sample testing.

2.3.4 Homeowners Manual

§10-103(b)

The final document in the compliance and enforcement process is the information that is provided to the homeowner. At the completion of construction and prior to occupancy, the builder must provide the homeowner with a manual that contains the information needed to operate the home in an energy efficient manner and to maintain it so that it will continue to work efficiently into the future.

The Energy Commission has developed a model for this purpose:

The California Home Energy Guide (P400-99-003) and can be seen at http://www.energy.ca.gov/efficiency/home_energy_guide/ or for further information contact the Energy Hotline (800) 772-3300

The builder may use the California Home Energy Guide publication or develop its own manual that provides the same information. The manual must contain all the information from the compliance documents including:

- Certificate of Compliance (CF-1R)
- Mandatory Measures Checklist (MF-1R)
- Installation Certificate (CF-6R)

For individually owned units in a multifamily building the documentation is provided to the owner of the dwelling unit or to the individual(s) responsible for operating the feature, equipment, or device. Information must be for the appropriate dwelling unit or building (photocopies are acceptable).

Example 2-1

Question

What are the plan checking/field inspection requirements related to the CF-6R?

Answer

The CF-6R (Installation Certificate) is not required to be submitted with other compliance documentation at the time of permit application, but rather is posted or made available for field inspection. A field inspector will want to check the equipment installed against what is listed on the CF-6R and compare the CF-6R and CF-1R for consistent equipment characteristics.

For a performance approach that relies on duct efficiency improvements or reduced envelope leakage, the field inspector should check the Special Features and Modeling Assumptions and HERS Required Verification listings on the CF-1R for required installer tests for reduced duct leakage or building pressurization and verify that these tests were performed and documented on the Installation Certificate CF-6R.

California Code of Regulations §10-103 allows the enforcement agency to request additional information to verify that the building construction is consistent with approved plans and specifications. When equipment efficiencies above the minimum requirements are shown on the CF-1R (e.g., 13 SEER cooling equipment; 0.63 energy factor water heater), the building

department should have procedures in place to verify efficiency. Requiring proof of efficiency from the installer, such as a copy of the appropriate page from a directory of certified equipment, is one possibility. Another possibility is to require that the applicant send a duplicate of the CF-6R through plan check for verification.

Example 2-2

Question

What happens to the CF-6R after the final inspection?

Answer

California Code of Regulations §10-103 requires that the builder provide to the “building owner, manager, and the original occupants the appropriate Certificate(s) of Compliance and a list of the features, materials, components, and mechanical devices installed in the building, and instructions on how to use them efficiently.” At a minimum, information on the CF-6R and CF-1R must be provided to the original building occupants along with operating and maintenance information such as the “The California Home Energy Guide to California Home Comfort and Energy Savings” (Energy Commission publication number P400-99-003-FXSX, where the XX are numbers that relates to a series of subject matter inserts that can be placed in the guide).

Example 2-3

Question

As a general contractor, when I have finished building a residence, is there a list of materials I am supposed to give to the building owner?

Answer

The “owner at occupancy” must receive a copy of the following completed forms for that dwelling unit:

1. Certificate of Compliance (CF-1R)
2. Mandatory Measures Checklist (MF-1R)
3. Installation Certificate (CF-6R)
4. In addition, they must receive either:
5. A manual which contains instructions for operating and maintaining the features of their building efficiently, or
6. The Guide to California Home Comfort and Energy Savings published by the Energy Commission.

As an alternative to including the forms, the builder may format the information in a manner more suitable for home owners. See section above describing the Homeowner’s Manual.

Example 2-4

Question

I built some multifamily buildings and have some questions about the information I must provide (as required by Administrative Regulations, §10-103). Specifically:

If the building is a condominium, can I photocopy the same information for all units?

When the building is an apartment complex (not individually owned units), who gets the documentation?

If an apartment is converted to condominiums, does each owner/ occupant receive copies of the documentation?

Answer

Photocopied information is acceptable. It must be obvious that the documentation applies to that dwelling unit—that is, the features installed must match the features shown on the Installation Certificate (CF-6R). If compliance documentation is for a “building,” a photocopy of the compliance forms for that building must be provided. If individual compliance is shown for each unique dwelling unit, a photocopy of the documentation which applies to that dwelling unit, must be provided.

The documentation and operating information is provided to whoever is responsible for operating the feature, equipment, or device (typically the occupant). Maintenance information is provided to whoever is responsible for maintaining the feature, equipment or device. This is either the owner or a building manager (§10-103).

If, during construction, the building changes from an apartment to condominiums, each owner at occupancy would receive the documentation. If an existing apartment building changes to condominiums at a later date, the documentation requirements are triggered only by a building permit application requiring compliance with the Energy Efficiency Standards. (Changing occupancy does not trigger compliance with the standards.)

2.4 Roles and Responsibilities

2.4.1 Designer

5537 and 6737.1 of California Business and Professions Code

The designer is the person responsible for overall building design. The designer is also responsible for compliance with the energy efficiency standards as well as all other building codes. The designer is required to sign the Certificate of Compliance (CF-1R) in the appropriate block. By signing, the designer is certifying that the building has been designed to comply with the energy efficiency standards and that they either:

- Directly prepared and coordinated the compliance documents, or
- Delegated responsibility to an energy documentation author who has provided the compliance analysis and documentation under their direction.

For many projects the designer will be an architect, engineer or other California licensed professional. However, a licensed professional is not always required for low-rise residential buildings. The California Business and Professions Code permits unlicensed designers for wood framed single family dwellings as long as they are no more than two stories in height (not counting a possible basement). Two-story wood framed multifamily buildings may also be designed by unlicensed designers as long as the building has three or fewer dwelling units.

When the designer is a licensed professional, the signature block must include the license number.

2.4.2 Documentation Author

The documentation author is the person responsible for completing the compliance documentation at the building permit phase that demonstrates that a building complies with the standards.

The documentation author is not subject to the limitations and restrictions of the *Business and Professions Code*. The documentation author's signature is to verify that the documentation is accurate and complete.

For a list of qualified documentation authors visit the Commissions website at http://www.energy.ca.gov/efficiency/cabec_roster.html

2.4.3 Builder or General Contractor

The builder means the general contractor responsible for construction. For production homes, the builder may also be the developer with responsibility for arranging financing, acquiring the land, subdividing the property, securing the necessary land planning approvals and attending to the other necessary tasks that are required prior to actual construction. Many production builders are also involved in the marketing and sales of homes after they are constructed.

During the construction process, the builder or general contractor usually hires specialty contractors to provide specific services, such as installing insulation, designing and installing HVAC systems, etc. For homes that do not require a design professional, the builder may sign the Certificate of Compliance (CF-1R) in the "Designer or Owner" signature block.

The builder may also sign the Installation Certificate (CF-6R) on behalf of the specialty contractors it hires, but normally completion and signature responsibility rests with the specialty contractor.

The contractor shall also cooperate with the HERS rater if field verification and/or diagnostic testing is required. One of the tasks is to provide the HERS provider a copy of the CF-6R signed by the appropriate builder employees or sub-contractors. This document will identify the measures that require field verification and/or diagnostic testing. Ultimately it is the builder's responsibility to ensure that the CF-6R is provided to the HERS rater (RACM Manual, chapter 7).

2.4.4 Specialty Contractors

Specialty contractors include the firms that install insulation, install windows, install HVAC systems and/or duct systems, install water heating and plumbing systems and perform other specialist type services during building construction. Though the builder has ultimate responsibility and may complete all the sections of the CF-6R, specialty contractors may, and are encouraged to, be responsible

for completing the portion of the Installation Certificate (CF-6R) representing the work for which they are responsible.

2.4.5 Building Department

The building department is the local agency with responsibility and authority to issue building permits and verify compliance with applicable codes and standards.

Building departments play several key roles in the compliance and enforcement process. They review the compliance documentation that is produced at the building permit phase and compare the documentation to the plans and specifications. When it has determined that the building design is in compliance with the standards, the building department issues a building permit.

During construction, building departments make several visits to the construction site to verify that the building is being constructed in compliance with the approved plans, specifications, and compliance documentation. As part of this process, they may review the Installation Certificate (CF-6R), which has details on energy efficiency features installed in the house and contains certifications by the appropriate contractors that the work was performed in compliance with the standards.

At its discretion, the building department may observe the diagnostic testing and field verification performed by subcontractors and the certified HERS rater, in conjunction with the building department's obligation to corroborate the results documented in installer certifications and in the Certificate of Field Verification and Diagnostic Testing (CF-4R).

For dwelling units that have used a compliance alternative that requires field verification and diagnostic testing, the building department will not approve a dwelling unit for occupancy until the building department has received from The HERS rater a Certificate of Field Verification and Diagnostic Testing (CF-4R) that has been signed and dated by the HERS rater. The builder is ultimately responsible for ensuring that the building department has received the CF-4R prior to the occupancy permit or final inspection.

2.4.6 HERS Provider

<http://www.cheers.org>

<http://www.calcerts.com>

The HERS provider is an organization that the Energy Commission has approved to administer a HERS program. The provider has responsibility to certify and train raters and maintain quality control over field verification and diagnostic testing required for compliance with the standards. In California, currently certified HERS providers are California Home Energy Efficiency Rating System (CHEERS) and California Certified Energy Rating & Testing Services (CalCERTS).

2.4.7 HERS Rater

The HERS rater is a person certified by an Energy Commission-approved HERS provider to perform the necessary field verification and diagnostic testing required for demonstrating compliance with the standards. HERS raters have special training in diagnostic techniques and building science and are capable of identifying problems while the home is still under construction. As long as the documentation author is not an employee of the builder or subcontractor whose work they are verifying, they can also act as the HERS rater.

The HERS rater is responsible for completing and signing the field verification and/or diagnostic testing certificate (CF-4R).

Example 2-5

Question

May a certified HERS rater, who does the field verification and completes and signs the CF-4R, do the testing required for the builder or installer to certify compliance with Title 24 installation requirements on the CF-6R?

Answer

Yes. This approach only works where the certified HERS rater is doing field verification for every house. It is not allowable in the case where the HERS rater is doing field verification only on a sample of homes. The builder or the installer must sign the CF-6R certifying compliance. The HERS rater may not sign the CF-6R. However, the builder or installer can rely on the HERS rater's diagnostic test results when the builder or installer signs the certification statement on the CF-6R. Of course, if the HERS rater determines that the compliance requirements are not met, the builder or installer may not sign the CF-6R until action is taken to make whatever corrections are necessary. Once corrections have been made, and the HERS rater determines that all compliance requirements are met, the builder or installer may certify the work by completing and signing the applicable section of the CF-6R. The rater then must complete and sign the CF-4R for this building.

Note that the HERS rater must complete diagnostic testing and field verification (as documented and certified on the CF-4R) after the measure is completely installed. For duct sealing, drywall must be completely installed before testing. A builder may contract with a certified HERS rater to complete testing at rough-in for quality control purposes, but such testing is not sufficient for meeting compliance requirements and certifications on the CF-4R.

2.4.8 Owner

Building owner means the owner of the dwelling unit. In the context of production homes, the owner is the person or family that the builder sells the house to. In custom homes and remodels, the owner may be the "builder" or developer and a general contractor, architect, engineer, etc. may be in their employment.

As part of the compliance process, the owner must receive a homeowner's manual at the time of occupancy.

Example 2-6

Question

What is my responsibility with respect to the CF-6R (Installation Certificate) (a) as an inspector and (b) as a builder?

Answer

The building inspector is responsible for checking the CF-6R at appropriate inspections to be sure it is filled out and signed for the completed work. Inspectors can verify that the installed features are “consistent with approved plans,” as indicated on the Certificate of Compliance (CF-1R) form. Since the CF-6R may be posted at the job site or kept with the building permit, the inspector can request that this form be made available for each appropriate inspection. It is not advisable to wait until the final inspection to check the CF-6R (§10-103).

The general contractor, or his/her agent (such as the installing contractor), takes responsibility for completing and signing the form for the work performed. (A homeowner acting as the general contractor for a project may sign the CF-6R.) The compliance statement for their signature indicates that the equipment or feature: 1) is what was installed; 2) is equivalent or more efficient than required by the approved plans (as indicated on the CF-1R); and 3) meets any certification or performance requirements (§10-103).

Example 2-7

Question

I heard that there are conflict-of-interest requirements that HERS raters must abide by when doing field verification and diagnostic testing. What are these requirements?

Answer

HERS raters are expected to be objective, independent, third parties when they are fulfilling their duties as field verifiers and diagnostic testers. In this role they are serving as special inspectors for local building departments. By law HERS raters must be independent entities from the builder or subcontractor installer of the energy efficiency features being tested and verified. They can have no financial interest in the installation of the improvements. HERS raters can not be employees of the builder or subcontractor whose work they are verifying. Also, HERS raters cannot have any financial interest in the builder's or contractor's business or advocate or recommend the use of any product or service that they are verifying. Section 106.3.5 of the CBC prohibits a special inspector from being employed (by contract or other means) by the contractor who performed the work that is being inspected.

The Energy Commission expects HERS raters to enter into a contract with the builder (not with sub-contractors) to provide independent, third-party diagnostic testing and field verification, and the procedures adopted by the Energy Commission calls for direct reporting of results to the builder, the HERS provider, and the building official. Although the Energy Commission does not recommend it, a “three-party contract” with the builder is possible, provided that the contract delineates both the independent responsibilities of the HERS rater and the responsibilities of a sub-contractor to take corrective action in response to deficiencies that are found by the HERS rater. Such a “three-party contract” may also establish a role for a sub-contractor to serve as contract administrator for the contract, including scheduling the HERS rater, invoicing, and

payment provided the contract ensures that monies paid by the builder to the HERS rater can be traced through audit. It is critical that such a “three-party contract” preserves rater independence in carrying out the responsibilities specified in Energy Commission-adopted field verification procedures. Even though such a “three-party contract” is not on its face in violation of the requirements of the Energy Commission, the closer the working relationship between the HERS rater and the sub-contractor whose work is being inspected, the greater the potential for compromising the independence of the HERS rater.

CHEERS and CalCERTS have been approved by the Energy Commission to serve as HERS providers to certify and oversee HERS raters throughout the state. These providers are required to provide ongoing monitoring of the propriety and accuracy of HERS raters in the performance of their duties and to respond to complaints about HERS rater performance. In cases where there may be real or perceived compromising of HERS rater independence, they are responsible for providing increased scrutiny of the HERS rater, and taking action to ensure objective, accurate reporting of diagnostic testing and field verification results, in compliance with Energy Commission adopted procedures.

Building officials have authority to require HERS raters to demonstrate competence, to the satisfaction of the building official. Building officials should place extra scrutiny on situations where there may be either real or perceived compromising of the independence of the HERS rater, and exercise their authority to disallow a particular HERS rater from being used in their jurisdiction or disallow HERS rater practices that the building official believes will result in compromising of HERS rater independence.

2.5 Field Verification and/or Diagnostic Testing

This section describes some of the procedures and requirements for field verification and/or diagnostic testing of energy efficiency features. This section is just an overview; details are available in the documents described below.

Field verification and/or diagnostic testing are performed by special third-party inspectors. The Energy Commission has given this responsibility to the HERS raters, who are specially trained and certified to perform these services. HERS raters cannot be employees of the builder or contractor whose work they are verifying. Also HERS raters cannot have financial interest in the builder's or contractor's business or advocate or recommend the use of any product or service that they are verifying.

2.5.1 Measures Requiring Field Verification and/or Diagnostic Testing

The following features require field verification and/or diagnostic testing:

- Duct sealing
- Supply duct location, surface area and R-factor
- Refrigerant charge in split system air conditioners and heat pumps
- Installation of TXV
- Adequate air flow

- Air handler fan power
- High energy efficiency ratio (EER)
- Maximum cooling capacity
- Building envelope sealing
- High quality insulation installation.

Field verification and testing is only required when measures or equipment are installed that require field verification and/or testing. If such measures or equipment are not installed, then field verification and testing is not required. For example, if there are no air distribution ducts or no new ducts in the case of additions, then no testing of ducts is required. Similarly, if there is no split system air conditioner or heat pump in a building using package C or D for compliance, then it is not necessary to diagnostically test the refrigerant charge.



2.5.2 Sampling

At the builder's option, HERS field verification and diagnostic testing may be completed either for each dwelling unit or for a sample of dwelling units. Sampling is permitted only when multiple dwelling units of the same type are constructed within the same subdivision by the same specialty contractors.

With the sampling approach, the HERS rater tests the first home for each model. As additional homes of the same model are constructed, the builder shall identify a group of up to seven dwelling units from which a sample will be selected for testing and the HERS provider is notified. The HERS rater then randomly selects at least one dwelling unit from the group and performs the tests on that unit. If the sampled unit passes, then all homes in the group are deemed to pass the tests.

If a sampled home fails, the HERS rater shall determine whether the failure was unique or that the rest of the dwelling units are likely to have similar failings. If the failing is considered unique, then the HERS rater chooses at random another house from the sample and performs tests on that house.

If the second house fails, then the builder is required to take corrective action in all unoccupied dwelling units in the group that have not been tested. The builder may also choose another path to compliance that does not involve a feature requiring field verification and/or diagnostic testing.

For multifamily buildings, variations in exterior surface areas caused by location of dwelling units within the building shall not cause dwelling units to be considered a different model for the purpose of sampling.

2.5.3 For More Information

More detail on field verification and/or diagnostic testing is provided in the *2005 Residential ACM Manual*, as described below:

- Chapter 7 of Residential ACM, Home Energy Rating Systems (HERS) Required Field Verification And Diagnostic Testing, has detailed procedures on who can perform third-party inspections, the type of inspections that can be performed, and procedures for sampling.
- Appendix ACM RC-2005 has procedures for testing air distribution ducts.
- Appendix ACM RD-2005 has procedures for verifying refrigerant charge.
- Appendix ACM RE-2005 has procedures for testing fan flow and fan power.
- Appendix ACM RF-2005 has procedures for HVAC sizing.
- Appendix ACM RH-2005 has procedures for high quality insulation installation.
- Appendix ACM RI-2005 has procedures for verifying air conditioning features such as thermal expansion valves and high EER ratings.

Example 2-8

Question

How does the sampling procedure for diagnostic testing for air distribution ducts apply to multifamily buildings?

Answer

If the builder chooses to do sampling, then the sampling is done on a dwelling unit basis. Under sampling, first a determination needs to be made of how many different types of dwelling units there are in the development.

For multi-family buildings, variations in exterior surface areas caused by location of dwelling units within the building do not cause dwelling units to be considered a different model. In this dwelling unit, the duct system associated with every HVAC unit in this dwelling unit must be tested. After that a sample of the remaining dwelling units must be tested, according to the procedure in Section 7.5 of the *2005 Residential ACM Manual*. In a dwelling unit that is to be tested in sampling, the duct system associated with every HVAC unit in that dwelling unit must be tested. No duct systems have to be tested in dwelling units that are not selected for sampling. In other words this is a sampling of dwelling units within buildings. Testing must be done on every duct system in a dwelling unit regardless of whether it appears that the HVAC and duct system are in conditioned space or not. This is akin to a single family residence with one HVAC unit serving upstairs with ducts in the attic and another serving downstairs with ducts between floors. For this single family counterpart case, both duct systems must be tested to get the duct sealing compliance credit.

The duct pressurization test has no way to determine if leakage is to outside or to inside. So, through this T-24 test there is no way to determine if the "plenum" which contains the ducts communicates to outside or not.

Also, "inside" and "outside" for leakage purposes is not defined by the locations of walls or the number of stories. The boundary between inside and outside for leakage purposes, is defined by the air boundary, typically drywall, between inside and outside. Spaces between floors and spaces in walls (including interior walls) are often "outside" from an air leakage perspective because they are not sealed effectively to form an air barrier and communicate to the outside.

Duct insulation is not required for ducts in conditioned space because there is an expectation that there will be reduced conduction losses for these ducts. But to get full credit for ducts in conditioned space, duct leakage must be tested and meet the requirements for duct sealing. In a multifamily building in order for compliance credit to be taken for ducts in conditioned space, all of the duct systems in the building must be in conditioned space unless compliance is documented for each dwelling unit separately. To meet the mandatory requirements all HVAC units must have ducts made of UL 181 approved materials (i.e., cased coils). Coils enclosed by sheetrock do not meet the mandatory requirements.